## ABSTRACT

An array of piezoelectric resonators used in a sensor device in order to identify chemical and biological agents. The resonators can operate as bulk acoustic wave (BAW), surface acoustic wave (SAW), or Love mode devices. The sensor device integrates gravimetric, calorimetric, thermal gravimetric, voltage gravimetric and optical detection methods into one sensor system, improving the accuracy of identifying hazardous agents. For gravimetric detection, dual-mode resonators provide simultaneous calorimetric and gravimetric data, one type from each mode. Resonators with heaters on the surfaces will provide thermal gravimetric data. An optical detector can be used to analyze the optical signal from the surface of a coated resonator. Additionally, voltage gravimetric measurements can be made with an electric field set up between the resonator and an external electrode. Thermal voltage gravimetric measurements can be made by adding an integrated heater on the resonator with an external electrode. An alarm can be activated upon the identification of a hazardous agent. The sensor device can utilize other valuable information, including traceable time, GPS location, and variables related to temperature, humidity, air speed, and air direction.


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